shifted horizontally at baselines listed) to show the 🛘 log R separation between — more uniform overall richness (e.g. Tunalik and Inigok wells). The pebble the 2 curves. The left two columns show the wire line log data used in the shale unit in the 5 eastern wells also has a richer interval at the top (also analysis and interpretation. Note that the sonic log is not shown to scale in the documented by TOC analyses on cuttings and core samples-- e.g., N. Inigok center column for wells where baseline shifts are noted. The right hand and Nechelik wells) as well as a distinctive thin, rich interval in the middle of column shows the 🛘 log R- derived profile of total organic carbon (TOC) in blue the unit. Both of these intervals also show relatively elevated resistivity and determined for the Lower Cretaceous succession in that well. In addition, TOC gamma-ray response as well as longer sonic travel times. Also notable are poster series) for discussion and interpretation of Rock-Eval data for these the GRZ, pebble shale unit, and in the lower part of the Torok Formation in the DT or ILD logs, or because that part of the section is determined not to be containing the highest TOC at their base (HTB units of Creaney and Passey, generally below 80 API units, although the Tunalik well has anomalously low transgressive/flooding events, in which case they would be likely to contain a gamma-ray signal compared to the other wells. A cut-off of 30 API units was greater proportion of marine organic matter. applied in the Tunalik well.

In determining the petroleum source potential of each succession, the net of kerogen present. However, TOC profiles produced by the technique in thickness of effective source rock greater than or equal to 2% was calculated conjunction with data from organic petrography or Rock-Eval pyrolysis that and the average TOC of that effective section is reported. The cut-off value of document the facies variation present in immature sections of the formation 2 wt % TOC is used for effective source potential based on hydrous pyrolysis can go far towards demonstrating a source rock's potential. Organic experiments (Mike Lewan, personal comm.) In the summary table below, the petrography for five samples from two wells of this study (Bayliss and thickness and richness of the effective Lower Cretaceous source rock is based Magoon, 1988) indicate that the pebble shale unit and the GRZ contain on the contiguous section of Gamma-Ray Zone (GRZ) of the Hue Shale and predominantly herbaceous + amorphous kerogens as compared to woody + the pebble shale unit in all except the Texaco Colville Delta 1 well, the only well inertinite components. Rock-Eval data from the pebble shale unit and the in this study in which the basal part of the Torok Formation is organic-rich -- > 2 GRZ (see Peters and others, this poster series) show that it contains both

greater than two wt % TOC. The average TOC of the effective section ranges understand their distribution in the region. from 2.6-4.1 wt %. Effective thickness ranges from 192 ft in the Tunalik and Inigok wells to 352 ft in the Kuyanak and 348 ft in the Texaco Colville Delta Where the Torok Formation is predominantly less than 2 wt % TOC it is likely well. TOC is predominantly 2-5 % throughout most of the succession, and to contain primarily Type III kerogen -- as most Rock-Eval data show (see more than 50 feet of section at the base of the Torok have TOC greater than 5 Formation (e.g., the Inigok well at 8237 and 8842 ft) are documented to have %. For the GRZ as a separate unit, the effective section averages 2.7-4.5 wt TOC >5 wt %, HI close to 200 mgHC/gTOC, and S2 > 5 mg/grock. The

derived TOC profiles for this succession is the predominance of fairly uniformly organic-rich rock in the pebble shale unit and GRZ succession that data are included in the summary table and in individual tables for each well by is overlain by organic-lean section of the basal part of the Torok Formation (six of the seven wells studied).

The GRZ and pebble shale unit of this study generally show a similar range

The \square log R technique does not directly determine organic facies or the type Type II and III kerogens, however, the distribution of kerogen types in these formation is less well known because of the small number of analyses. indicate that the pebble shale unit and GRZ succession is Additional Rock-Eval and organic petrography analyses are needed in

averages 2.5-4.1 wt % TOC over 97-303 ft. higher GR response and slower sonic travel time, and is likely to contain Type II kerogen and be oil prone.

CONCLUSIONS

Total organic carbon profiles produced by the \square log R technique in conjunction with analyses from Rock-Eval pyrolysis provide a powerful tool for evaluating successions of northern Alaska. This technique was used to analyze the TOC in the Lower Cretaceous mudstone succession in seven wells within the NPRA and the adjacent area of the Colville River delta. The results show that this succession -- ranging from immature to post-mature rocks -- including the lower part of the Torok Formation, the Gamma Ray Zone of the Hue Shale, and the pebble shale unit has (or had) important potential for oil and gas generation in this region.

Profiles of TOC determined by the [] log R technique in addition to individual measurements of TOC by Rock-Eval pyrolysis and other methods indicate that the contiguous Lower Cretaceous succession that includes the GRZ and the pebble shale unit predominantly contains greater than 2 wt % TOC. However, the distributions of organic facies or types of kerogen present in the succession are less well known. Rock-Eval data from several wells indicate that both Type II and Type III kerogens are present. Because the [] log R technique cannot confirm the type of kerogen present, additional organic petrography and Rock-Eval analyses are needed in immature sections of the formation to confirm the proportion of these organic facies and to understand their distribution.

The Torok Formation is predominantly organic-lean and likely to contain mainly Type III kerogen. However, in the Colville Delta 1 well the TOC profiles determined by the \square log R technique indicate that richer facies, possibly Type Il kerogen, occur at the base of the Torok Formation. Geophysical log response also indicates that the Torok commonly has multiple thin, organic-

WELL NAME	Tunalik 1	Kuyanak 1	Inigok 1	N Inigok 1	Nechelik 1	Bergschrund 1	Texaco Colville Delta 1
Source Rock Unit	GRZ + pebble sh	lowerTorok+GRZ+pb sh					
Depth Evaluated (from KB)	10,635-10,900	4640-5080	9040-9260	7385-7650	6590-6806	6479-6790	5645-6072
LOM	10	8	10	8.4	8	8.4 GRZ, 8 psu	8
Total thickness in feet	265	440	220	265	216	311	427
Effective							
thickness(TOC>=2%)	192 ft	352 ft	192 ft	227 ft	195 ft	228 ft	348 ft
Average TOC>=2 wt %	2.58%	4.11%	3.15%	3.74%	4.09%	3.07%	3.79%
TOC range (wt %)	2-3.7%	2-9.6%	2-6.5%	2-6.2%	2-6.9%	2-8.7%	2-9.5%

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Total thickness in feet 440 70 370

Effective thickness(TOC>=2%) 352 ft 49 ft 303 ft

 Average TOC>=2 wt %
 4.11%
 4.29%
 4.08%

 TOC range
 2-9.6
 2-9.6
 2-6.6

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